

Candidates for main-belt asteroids with surface inhomogeneity

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Terrestrial differentiated objects in the Solar System, such as the Mercury, Earth, Mars, and the Moon, have geologically complex surfaces with compositional inhomogeneities. Previous studies using spacecraft and telescopes have shown that asteroids larger than 100 km in diameter also exhibit surface inhomogeneities at global scales, while smaller objects have not yet to show such features. Here, Hasegawa et al. 2024, AJ 167, 224 investigate inhomogeneous surface candidates in a sample of 130 main-belt asteroids using multi-epoch spectroscopic data from the MIT–Hawaii Near-Earth Object Spectroscopic Survey (Binzel et al. 2019, Icarus 324, 41), which has been observing asteroids using a self-consistent observing technique for about 20 years. 12 reliable candidates with spectra more than 3σ apart from each other at 2.4 micron and 52 optimistic candidates for surface inhomogeneities are detected. Eight objects with surface inhomogeneities have been reported as candidates. The study suggests that the size limit between small homogeneous bodies and larger inhomogeneous objects, if it exists at all, is less than 100 km in diameter. A-type objects have a higher rate of inhomogeneous candidates than other spectral type bodies. This may be because olivine, which is the surface principal component of A-type asteroids, has a more efficient response to space weathering than does pyroxene, so that a similar range of surface ages translates into a wider range of visible to near-infrared spectral slopes in the case of A-type bodies.

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